

REMARKS

Claims 1-53 are pending in the application and are subject to restriction. Applicants previously elected to prosecute the subject matter recited in claims 1-30, and hereby cancel non-elected claims 31-53. Applicants reserve the right to prosecute the subject matter of canceled claims 31-53 in one or more continuation applications.

Independent claims 1 and 20 have been revised to recite a solid oxide fuel cell "that can operate with a sulfur-containing hydrocarbon fuel that does not have to undergo prior treatment to remove organic sulfur compounds." Support for the amendment can be found in the specification, *inter alia*, at page 4, lines 12-15. No new matter is presented by the amendment, and the amendment is made in response to the Examiner's comments in the most recent Office Action. Consequently, the amendments could not have been presented earlier. In addition, the amendments place the claims in condition for allowance. Many of the dependent claims have been revised to be consistent with the language used in other dependent claims, and to insert a comma at the end of the Markush group listing so that the claims are grammatically accurate. No new matter is presented by these amendments, and the amendments place the claims in better form for appeal. Accordingly, applicants respectfully request entry thereof and reconsideration of claims 1-30 in light of the following remarks.

On pages 1-5 of the Action, claims 1-6, 9-27, and 30 remain rejected under 35 U.S.C. §103(a) as being unpatentable over Wallin, U.S. Patent No. 6,017,647 ("Wallin") in view of Anumakonda. The Action simply repeats the previous rejection. For the reasons set forth in applicants' response filed on September 17, 2003, this rejection is respectfully traversed.

In the Action, the Examiner recognizes applicants' previous arguments with respect to Anumakonda's requirement of additional sulfur removal unit operations up-stream from the solid oxide fuel cell, and that the fuel that is administered to the fuel cell does not contain sulfur. The Examiner states in response to these arguments, however, that the claims are open ended "which would include additional processing limitations" (Office Action mailed November 3, 2003, page 8, paper No. 14). The Action also states that the claims do not recite a solid oxide fuel cell capable of directly processing a sulfur-containing hydrocarbon fuel without reformation prior to introduction into the fuel cell. Applicants respectfully disagree.

Although the claims as initially presented recited “a solid oxide fuel cell comprising,” which as noted by the Examiner is open ended, the claims also required the fuel cell to contain a fuel comprising a sulfur-containing hydrocarbon. Thus, to the extent that the prior art reforms the sulfur-containing fuel prior to introduction to the fuel cell, and consequently only introduces a non-sulfur containing hydrocarbon fuel, the prior art can not disclose or suggest a fuel cell that includes a sulfur-containing hydrocarbon. To resolve any doubt however, applicants have revised the claims to recite a solid oxide fuel cell “that can operate with a sulfur-containing hydrocarbon fuel that does not have to undergo prior treatment to remove organic sulfur compounds.” This language does not alter the scope of the claims since the claims as originally presented implicitly included the language. In addition, the amendment directly counters the Examiner’s rebuttal of applicants’ arguments, thereby rendering the claims allowable over the prior art.

With respect to the prior art rejection, applicants respectfully submit that Anumakonda does not teach using a sulfur-containing hydrocarbon fuel as the fuel source for a solid oxide fuel cell. Indeed, Anumakonda teaches directly away from this aspect of the invention by requiring reformation of the fuel by use of a catalytic partial oxidation process to yield hydrogen and carbon monoxide, and then introduction of the hydrogen to the solid oxide fuel cell. Thus, Anumakonda discloses at best a solid oxide fuel cell containing hydrogen as the fuel source. Applicants note that the claims recite a solid oxide fuel cell that contains a sulfur-containing fuel, which is directly contrary to Anumakonda’s teachings.

A person skilled in the art would not have been motivated to make the hypothetical combination asserted in the Action because such a combination increases the complexity and cost of Wallin’s fuel cell by requiring additional unit operations up-stream from the solid oxide fuel cell. Even if the disclosures were combined, the combined teachings would not result in a solid oxide fuel cell including a sulfur-containing hydrocarbon, as recited in the present claims. Rather, the combined teachings would result in sulfur-removal unit operations up-stream from Wallin’s fuel cell, and then introduction of hydrogen only into the fuel cell. The combination of Wallin and Anumakonda therefore fails to render obvious the present claims, and applicants respectfully request that the Examiner reconsider and withdraw this rejection.

On pages 5-7 of the Action, claims 1, 2, 7, 8, 20, 28 and 29 are rejected under 35 U.S.C. §103(a) as being unpatentable over Wallin in view of Fasano, *et al.*, U.S. Patent No.

6,051,330 (“Fasano”) as evidenced by Yamauchi, *et al.*, U.S. Patent No. 4,228,033 (“Yamauchi”). The Action repeats the previous rejection. For the reasons set forth in applicants’ response filed on September 17, 2003, this rejection is respectfully traversed.

The Action recognizes applicants’ arguments with respect to the level of sulfur typically present in methanol, and responded by stating that “[a]pplicant has not submitted any supporting document to substantiate the alleged claim,” (Office Action mailed November 3, 2003, page 8, paper No. 14). Applicants attached a number of documents supporting their arguments in their response filed September 17, 2003, but it appears that the documents did not reach the Examiner. Applicants attach hereto the documents that support the arguments previously advanced (relevant portions of the documents have been highlighted in yellow). To the extent these documents do not reach the Examiner, applicants respectfully request that the Examiner contact the undersigned at the telephone number listed below.

With respect to the prior art rejections, applicants reiterate the following. Yamauchi is not relevant to the present invention, and is non-analogous art with respect to Wallin and Fasano. Even if Yamauchi discloses the presence of sulfur impurities in the methanol that it uses, this disclosure does not suggest that the methanol disclosed by Fasano includes any sulfur. Indeed, the methanol utilized by Yamauchi was purposefully chosen to include sulfur so that it could deactivate the catalyst in the conventional hydro-cracking reaction disclosed therein. This deactivated catalyst then is reactivated in accordance with Yamauchi’s invention.

Yamauchi does not disclose that the “typical sulfur content in the methanol is found to be between 1 to 5 ppm,” as alleged in the Action. In fact, the sulfur present in the methanol used in Yamauchi’s examples is atypical, and is used on purpose to deactivate the catalyst so that Yamauchi can carry out its invention to reactivate it. Methanol typically does not contain sulfur in amounts above 0.5 ppm. Applicants are attaching hereto documents describing the sulfur content of commercially available methanol for use in fuel cells as typically being zero, and at most about 0.5 ppm.

Fasano also does not disclose or suggest that the hydrocarbon fuels described therein as useful in a solid oxide fuel cell contain any sulfur. A person skilled in the art therefore would not have been motivated to combine Fasano’s teachings with Yamauchi’s sulfur-enriched methanol because Yamauchi specifically used methanol with higher amounts of

sulfur than typical to deactivate the hydro-cracking catalyst described therein. Any combination of Fasano and Wallin with Yamauchi therefore is improper. In addition, a skilled artisan would not have used Yamauchi's sulfur-enriched methanol in Fasano or Wallin because the prior art (*e.g.*, Anumakonda) taught that sulfur can poison the catalyst in the solid oxide fuel cell to a point where the catalyst becomes completely deactivated (col. 2, lines 50-52). Accordingly, any combination of Yamauchi with Fasano or Wallin would destroy the fuel cell. Combining documents in a manner that destroys or frustrates the fundamental purpose of the primary reference is the antithesis of obviousness.

Fasano also teaches directly away from the present invention.¹ Fasano states that hydrogen is the ideal fuel, and that some light hydrocarbons can be used, but teaches away from using heavy hydrocarbons, like JP8 (*see*, claims 3, 4, 22, and 23 of the present application that recite the use of JP8). In light of this disclosure in Fasano, a person skilled in the art would not have been motivated to use a sulfur-containing fuel as the fuel source for the solid oxide fuel cell of Wallin.

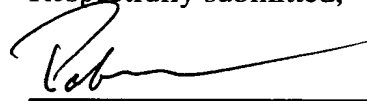
In sum, skilled artisans would not have been motivated to combine the cited art in the manner suggested in the Action. Even if combined, the combined teachings do not disclose or suggest the claimed invention because the art fails to disclose that the methanol fuel of Fasano has a sulfur content within the claimed range — indeed, it suggests otherwise. The combination of Wallin, Fasano, and Yamauchi therefore fails to render obvious the present claims. Accordingly, applicants respectfully request that the Examiner reconsider and withdraw this rejection.

¹ Applicants note the Examiner's comments on page 8 of the most recent Action mailed November 3, 2003, paper No. 14 with respect to Fasano. While applicants respectfully disagree with the Examiner, the argument previously presented by the applicants regarding Fasano's disclosure is not repeated here for the sake of expediting prosecution. There is no need to argue over an ancillary issue that neither supports nor rebuts the obviousness rejection.

In view of the foregoing, applicant respectfully submits that the present claims are in condition for allowance. An early notice to this effect is earnestly solicited. Should there be any questions concerning this response, Examiner Yuan is invited to contact the undersigned at the telephone number listed below.

2/2/04
Date

Respectfully submitted,



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